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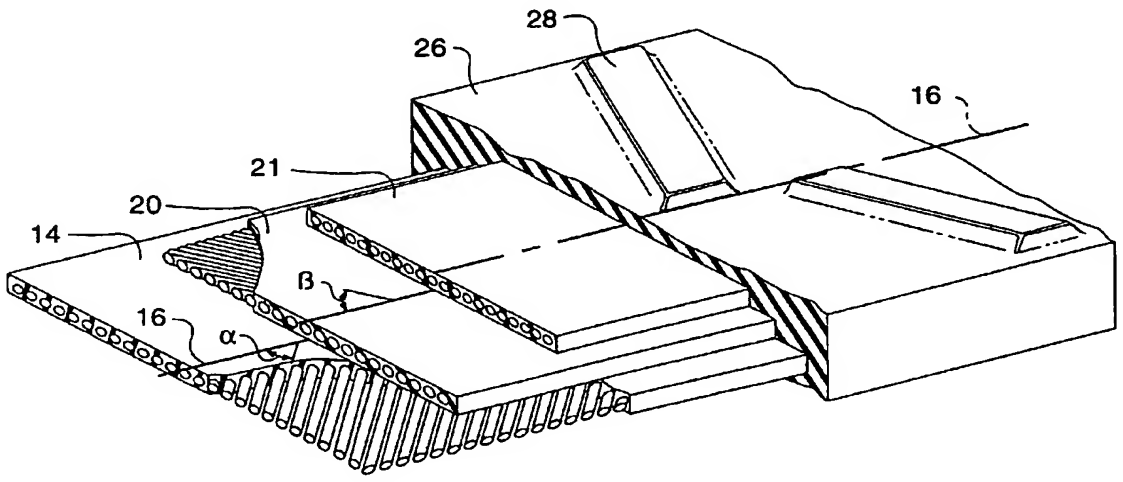
(54) Title: RUBBER TRACK BELT WITH RELOCATED CIRCUMFERENTIAL CABLES



(57) Abstract: An endless elastomeric track belt for heavy mobile equipment with the zero degree cable ply relocated radially outward from the inner diameter of the track belt (10). This construction results in improved tear strength of the track belt (10) and decreased tread bar wear.

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Description

RUBBER TRACK BELT WITH RELOCATED CIRCUMFERENTIAL CABLES

Technical Field

This invention relates to an endless track belt, and more particularly to an elastomeric track belt for heavy mobile equipment and having improved tear strength and decreased tread bar wear.

Background Art

In heavy duty agricultural, hauling, road paving, earthmoving, and military applications, the demands upon a continuous elastomeric or rubber track belt are particularly great. When driving on pavement, the tread bar wear on the treads can be significant. Additionally, the track belt should have a longitudinal stiffness in the lateral direction sufficient for minimizing deflection or snaking thereof when obstacles are encountered or when uneven terrain is encountered. Finally, the track belt should also exhibit good tear strength when encountering rock or debris.

U.S. Pat. No. 5,211,609 issued 18 May 1993, to The Goodyear Tire & Rubber Company, discloses an endless elastomeric track belt with multiple plies that are designed to minimize lateral shifting of the belt. The belt disclosed had a first ply of wire cable reinforcement substantially parallel, i.e. about 0°,

to the longitudinal direction of the belt and placed radially inboard adjacent to the steel support wheel about which the track belt is entrained.

The second and third plies are bias plies of wire cable with angles equal and opposite to one another. An optional fourth ply whose direction was perpendicular, i.e. 90°, was also disclosed.

Other prior art belt arrangements also utilized the parallel or 0° cable reinforced ply on the interior diameter of the belt adjacent to the steel wheel. It was thought that the parallel or 0° cable reinforced ply, which keeps the belt from stretching under tension, would be damaged by outside debris and thus, needed to be placed as close to the inner diameter of the belt as possible to be protected by the other plies. However, a rock ingested between the belt and the steel drive wheel will cause a 0° cable to break on the inner diameter and a tear will propagate across the belt, usually disabling the belt.

Additionally, when traveling on pavement, placement of the 0° cable ply adjacent the inner diameter of the belt increases scuffing of the tread bar tips while in contact with the road surface.

Summary of the Invention

In accordance with the present invention, an endless elastomeric track belt for heavy mobile equipment provides improved tear strength for the track belt and decreased tread bar wear. The track

belt includes an endless body having an interior surface and an exterior surface.

A first bias ply portion has at least one cable oriented at an angle to the longitudinal direction of the belt. A second bias ply portion has at least one cable oriented at an angle to the longitudinal direction and is located radially outward of the first bias ply portion. The second bias ply portion is opposite in direction to the first bias ply portion. A third ply portion of at least one spirally wrapped cable is oriented in a substantially parallel relation to the longitudinal direction, thus is termed the 0° ply.

Brief Description of the Drawings

Fig. 1 is a fragmentary side elevational view of a first embodiment of an endless track belt of the present invention and shown;

Fig. 2a is a perspective view of the belt of the first embodiment shown in Fig. 1 with the ply portions broken away in layers;

Fig. 2b is a perspective view similar to Fig 2a but showing a second embodiment of the belt with the ply portions broken away and shown in layers;

Fig. 2c is a perspective view similar to Fig 2a and 2b but showing a third embodiment of the belt with the ply portions broken away and shown in layers;

Fig. 3 is an isometric view of a rubber-belted undercarriage showing an endless track belt of

the present invention entrained about a drive wheel, midwheels, and an idler wheel.

Best Mode for Carrying Out the Invention

Referring more particularly to the drawings, a track undercarriage unit 8 is shown at Fig. 3, which has an elastomeric or rubber track belt embodying the principles of the present invention generally shown in Fig. 1. Such track undercarriage 8 is typically employed for supporting and, in some instances, propelling a work vehicle, such as an agricultural tractor, asphalt paving machine, military vehicles, hauling units and the like(not shown).

Referring to Figs. 1 and 3, the rubber belted track undercarriage 8 also typically includes a drive wheel 30 at one end, an idler wheel 34 at the opposite end and one or more lower roller wheels or midwheels 36 mounted between the drive wheel 30 and the idler wheel 34. The rubber track belt 10 is entrained about the drive and idler wheels and is in supported engagement with the roller wheels 36.

As best shown in Figs. 1-3, the track belt includes a endless body extending in a longitudinal direction(or along a longitudinal axis) 16. The body has an exterior surface 26 and an interior surface 12. The body also preferably has a plurality of longitudinally spaced guide blocks 33 for maintaining the track centered on the wheels during operation, which extend radially inwardly from the interior surface 12. A plurality of spaced-apart ground

engaging cleats or tread bars 28 are preferably provided on the exterior surface 26 to provide greater traction with the ground surface.

The track body is constructed with multiple steel reinforced plies, including at least an inner or first ply portion 14, a second ply portion 20, and a third ply portion 21. Of particular importance to the present invention is the type and order of the various plies. In one embodiment of the present invention depicted in Fig. 2a, the first and second plies are bias plies, 14, 20, in which the steel cables of each of such plies are disposed at opposite angles to one another and at an angle to the longitudinal axis 16 of the body. Preferably, the first bias ply 14 has at least one cable therein and is disposed at a positive angle of about between 25 and 75 degrees, and more preferably 40 to 70 degrees, while the second bias ply is disposed at a negative angle of about between -25 and -75 degrees, and more preferably -40 and -70, degrees from the longitudinal axis. As depicted in the drawings, the first bias ply portion 14 is located inboard adjacent the interior surface 12 of the body, while the second bias ply portion 20 is located adjacent, but radially outboard of the first ply.

The third ply portion 21 is disposed radially outward from the second bias ply portion 20. The third ply portion 21 is a spirally wrapped cable ply, also known as a 0° ply, which extends in or substantially parallel to the longitudinal direction 16.

A second embodiment of the present invention is shown in Fig. 2b, wherein like elements have the same reference numerals. In the second embodiment, the track belt 10 is provided with a fourth ply portion 24. The fourth ply portion 24 has at least one cable that is laid nearly perpendicularly or about 90° to the longitudinal axis 16 of the body. Utilization of the fourth ply portion 22 is the preferred embodiment of the invention because the fourth ply portion 24 protects the third 0° ply portion 21 from outside damage due to debris, rock, or concrete, especially in industrial applications.

A third embodiment of the present invention is shown in Fig. 2c, wherein the elements have the same reference numerals. In the third embodiment, the track belt 10 is provided with a fourth ply portion 24 radially inward from the third 0° ply portion 21. The third 0° ply portion 21 is placed on the outer diameter of the track belt 10 which provides the minimum tread bar wear while maintaining maximum tear strength of the track belt 10.

A final layer of rubber is laid radially outward of the third bias ply portion 21 or the fourth ply portion 24, depending upon the chosen embodiment, to form an exterior surface 26.

Referring to Fig. 3, a drive wheel 30 frictionally transmits power to the track belt 10. A plurality of upraised cleats or tread bars 28 move along the circumference of the track belt 10, continuously engaging and disengaging with the ground.

Industrial Applicability

The track belt 10 of the present invention is typically produced on a cylindrical mandrel by applying one or more layers of an elastomeric or rubber either directly onto the mandrel or onto an impression fabric which has been applied to the mandrel to form an interior surface 12 of the belt.

A plurality of ground engaging cleats or tread bars 28 extend outwardly from the exterior surface 24 of the body and are preferably integrally formed with the elastomeric material of the belt body for penetrating the earth and enhancing the tractive capability of the vehicle. The elastomeric or rubber-like character of the tread bars 28 permits a work vehicle to travel over improved road surfaces without damage thereto. The tread bars 28 can be any one of a number of natural or synthetic polymers well known in the art and compounded with the usual rubber chemicals to provide adhesion to the cable reinforcement and to vulcanize into a unitary body.

A plurality of lateral alignment members or guide blocks 33 extend inwardly from the interior surface 12 and are preferably integrally formed with the elastomeric material of the track belt 10. These configurations are well known to those skilled in the art.

The first layer of elastomeric or rubber material is followed by the first bias ply portion. The first bias ply portion 14 is laid at an angle α to

the longitudinal direction 16. The second ply is then applied upon the first ply and is laid on an angle β to the longitudinal direction 16 of the interior surface 12. This second bias ply portion 20, however, is disposed in a direction opposite to the first ply or from its angle α.

The structure of the track belt 10 with the 0° ply portion 21 being relocated toward the outer diameter of the track belt 10 provides several advantages. First, it increases the tear strength of the track belt 10 when a rock or debris is ingested between the interior surface 12 of the track belt 10 and the drive wheel 30. If the 0° ply portion 21 is on the interior surface of the track belt 10 and a rock gets ingested, the high stress on the 0° cables may cause a break in the cable, which results in propagation of the tear across the width of the 0° ply portion 21 immobilizing the track belt 10. Relocation of the 0° ply portion 21 radially outward of the first bias ply portion 14 and the second bias ply portion 20 cushions and protects the track belt 10 from tear propagation.

A second advantage of the relocation of the 0° ply portion 21 toward the exterior surface 26 is the decreased wear of the tread bars 28 when travelling on a paved surface. In prior art configurations with the 0° ply portion 21 adjacent the interior surface 12, the tread bars 28 wore at the tip of the tread bars 32 due to scuffing which occurred during engagement and disengagement of the of the

tread bars from the pavement 31. The scuffing was caused by the stretching and relaxing of the tread bars 28 of the track belt 10 while in contact with the pavement. The tread bars 28 stretched as they curled around the drive wheel 30 or idler wheel 34 because they were located a greater distance from the 0° ply portion 21, which acted as the neutral bending axis of the track belt 10.

In the present invention, the 0° ply portion 21 is moved radially outward toward the exterior surface 26 and thus, the tread bars 28 will be minimally stretched. This relocation greatly reduces scuffing because it is the stretching and relaxing of the tread bars which causes the tips of the tread bars 32 to drag during engagement or disengagement from the pavement.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it would be obvious to one skilled in the art that various changes and modifications may be made therein without departing from the spirit or scope of the invention.

Claims

1. An endless elastomeric track belt (10) for heavy mobile equipment comprising:

an endless body having an interior surface (12) and an exterior surface (26) extending in a longitudinal direction (16);

a first bias ply portion (14) within said body having at least one cable oriented at an angle to said longitudinal direction (16);

a second bias ply portion (20) within said body having at least one cable oriented at an angle to said longitudinal direction (16) outwardly of said first bias ply portion (14) and opposite in direction to said first bias ply portion (14); and

a third ply portion (21) of at least one spirally wrapped cable oriented in substantially parallel relation to said longitudinal direction (16) outwardly of said second bias ply portion (20).

2. The endless elastomeric track belt (10) of claim 1 including a fourth ply portion (24) within said body having at least one cable oriented at about 90° to said longitudinal first direction (16).

3. The endless elastomeric track belt (10) of claim 2 wherein said fourth ply portion (24) is located outwardly of said first ply portion (20).

4. The endless elastomeric track belt (10) of claim 2 wherein said fourth ply portion (24) is located outwardly of said second bias ply portion (20).

5. The endless elastomeric track belt (10) of claim 2 wherein said fourth ply portion (24) is located outwardly of said third ply portion (21).

6. The endless elastomeric track belt (10) of claim 1 wherein said cables are steel.

7. The endless elastomeric track belt (10) of claim 1 wherein said angle of said first bias ply portion (14) is about between 25° and 75° from said longitudinal direction (16).

8. The endless elastomeric track belt (10) of claim 1 wherein said angle of said second bias ply portion is about between -25° and -75° from said longitudinal direction (16).

9. An endless elastomeric track belt (10) for heavy mobile equipment having a pair of longitudinally spaced and a substantially cylindrical wheel (18) comprising:

an endless body entrained about said cylindrical wheel (18) and having an interior surface (12), and exterior surface (26) and opposite side

surfaces and a longitudinal direction (16) therethrough;

a first bias ply portion (14) within said body having at least one cable oriented at an angle to said longitudinal direction (16) and located at or near the pitch line (13);

a second bias ply portion (20) within said body having at least one cable oriented at an angle to said longitudinal direction (16) outwardly of said first bias ply portion (14) and opposite in direction to said first bias ply portion (14); and

a third ply portion (21) of at least one spirally wrapped cable oriented in substantially parallel relation to said longitudinal direction (16) outwardly of said second bias ply portion (14).

10. The endless elastomeric track belt (10) of claim 9 including a fourth ply portion (24) within said body having at least one cable oriented at about 90° to said longitudinal first direction (16).

11. The endless elastomeric track belt (10) of claim 10 wherein said fourth ply portion (24) is located outwardly of said first ply portion (14).

12. The endless elastomeric track belt (10) of claim 10 wherein said fourth ply portion (24) is located outwardly of said second bias ply portion (14).

13. The endless elastomeric track belt (10) of claim 10 wherein said fourth ply portion (24) is located outwardly of said third ply portion (20).

14. The endless elastomeric track belt (10) of claim 9 wherein said cables are steel.

15. The endless elastomeric track belt (10) of claim 9 wherein said angle of said first bias ply portion (14) is about between 25° and 75° from said longitudinal direction (16).

16. The endless elastomeric track belt (10) of claim 9 wherein said angle of said second bias ply portion is about between -25° and -75° from said longitudinal direction (16).

Fig. 1

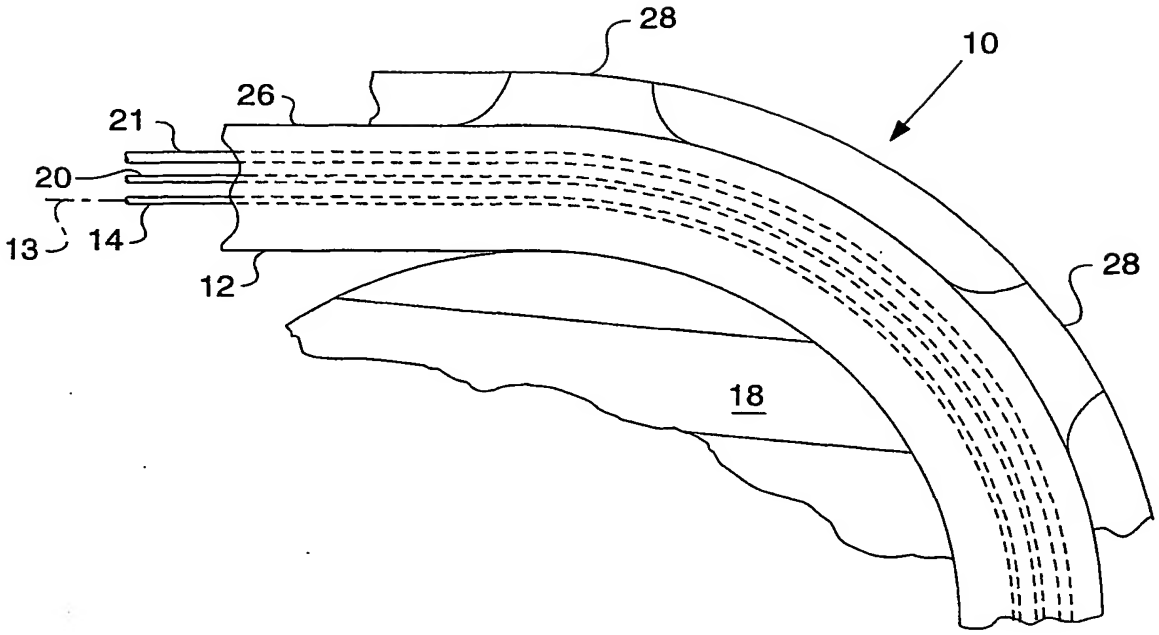


Fig. 2a

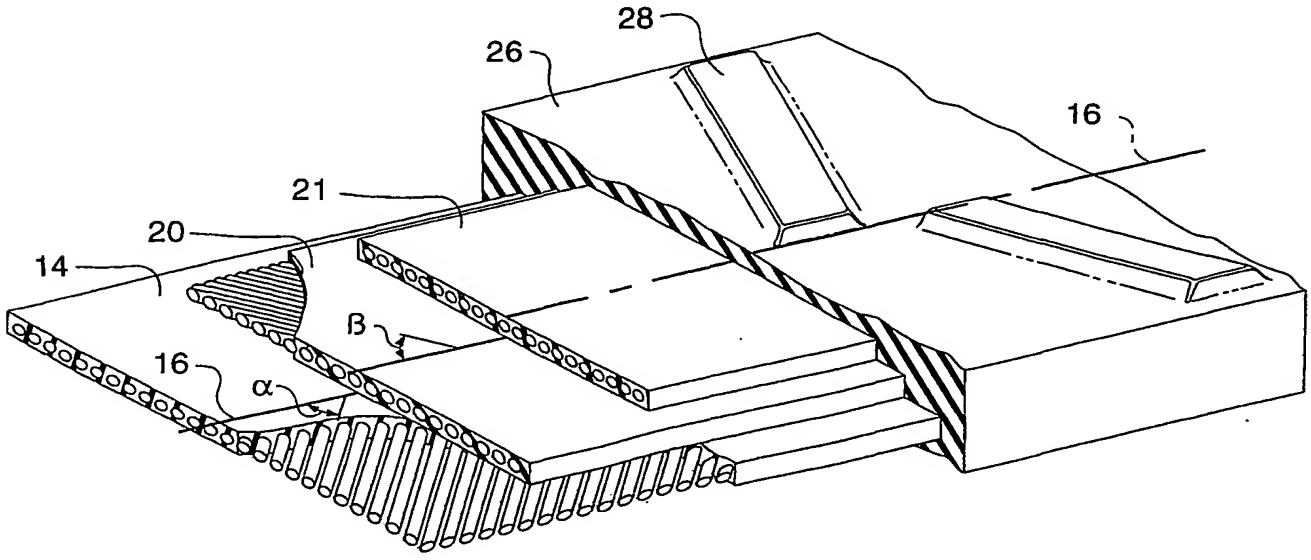


Fig. 2b

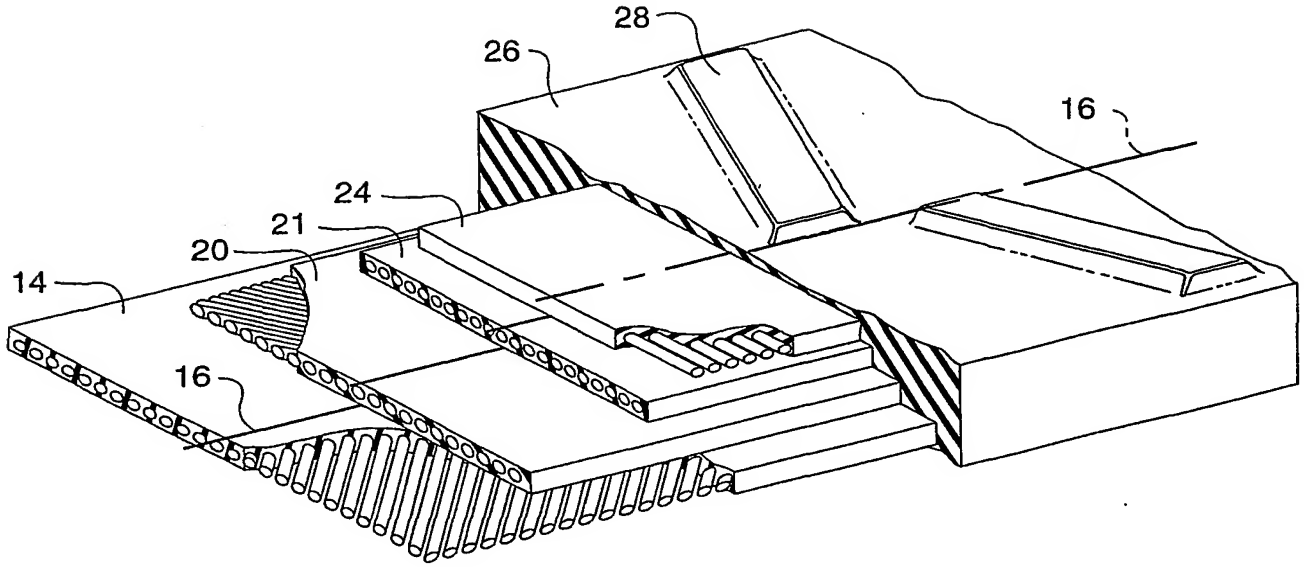


Fig. 2c

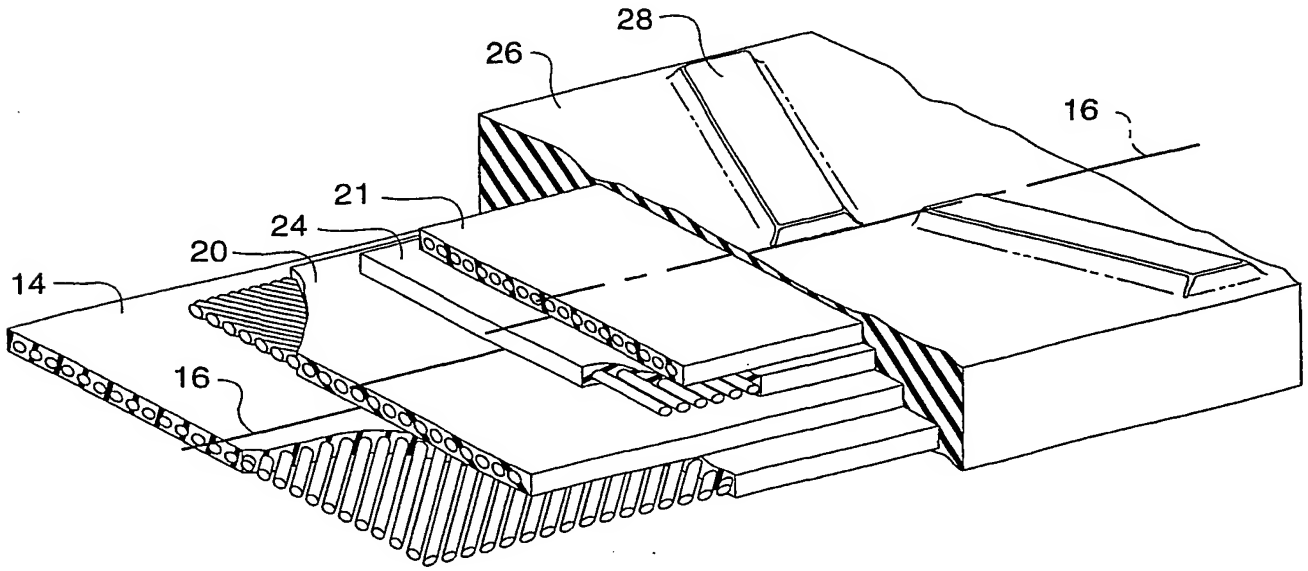
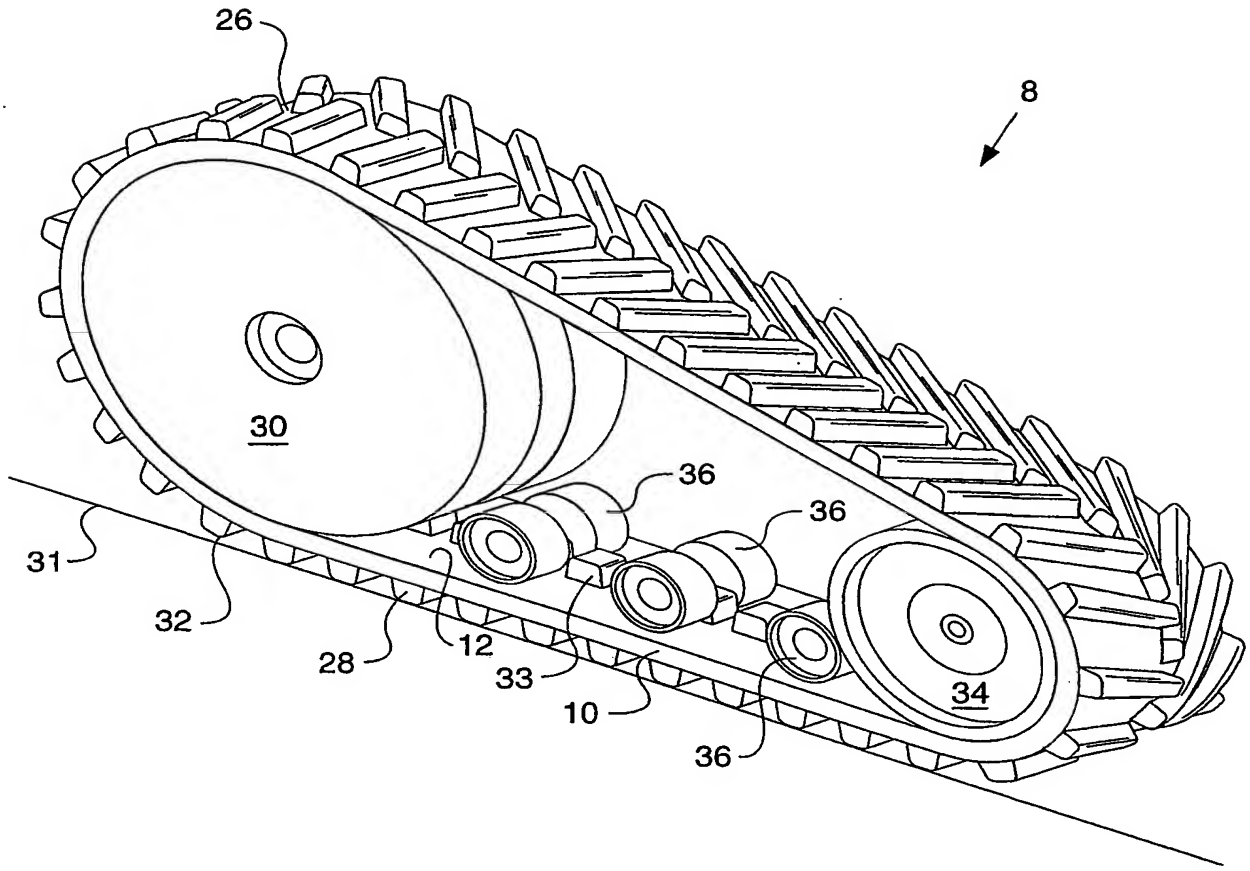


Fig. 3



INTERNATIONAL SEARCH REPORT

Intern··· ·pplication No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B62D55/24 B62D55/253 F16G1/06 F16G1/08 F16G1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B62D F16G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 742 382 A (GOODYEAR TIRE & RUBBER) 13 November 1996 (1996-11-13) figure 3 column 2, line 11 -column 2, line 32	1,9
A	US 5 211 609 A (HAINES EDWIN L) 18 May 1993 (1993-05-18) cited in the application column 2, line 11 -column 2, line 68; figure 1	1-16

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
17 October 2001	23/10/2001

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

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